A satellite map of North America, showing the United States, Canada, and Mexico. The map is centered on the continent, with the Atlantic Ocean to the east and the Pacific Ocean to the west. The text is overlaid on a semi-transparent white box in the center of the map.

Highlights and Outstanding Questions from the NOAA CMIP5 Task Force Analysis of N. American Climate

The CMIP5 Task Force organized by the NOAA Climate Program Office, Modeling, Analysis, Predictions and Projections (MAPP) Program

CMIP5 TASK FORCE

Advancing long-term outlooks for North America

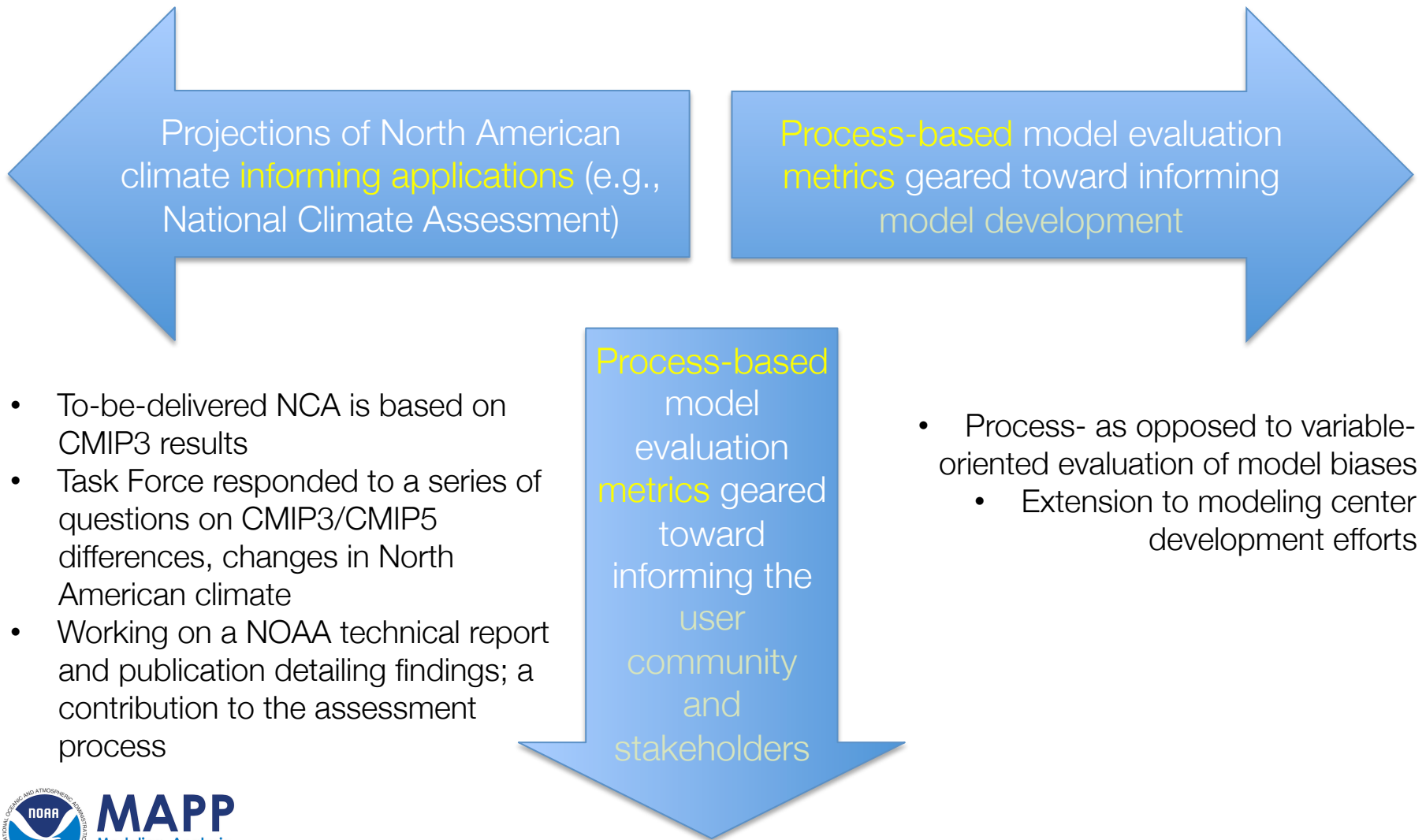
Jim Kinter (Lead)	Lindsey Long
Eric Maloney (Co-Lead)	Kingtse Mo
Justin Sheffield (Co-Lead)	J. David Neelin
Melissa Bukovsky	Sumant Nigam
Suzana Camargo	Zaitao Pan
Leila Carvalho	Alfredo Ruiz-Barradas
Edmund Chang	Richard Seager
Brian Colle	Yolande Serra
Paul Dirmeyer	Anji Seth
Rong Fu	Julienne Stroeve
Lisa Goddard	De-Zheng Sun
Marty Hoerling	Gabriel Vecchi
Qi Hu	Chunzai Wang
Xianan Jiang	Shang-Ping Xie
Nat Johnson	Jin-Yi Yu
Charles Jones	Tao Zhang
Kristopher Karnauskas	Ming Zhao
Ben Kirtman	
Arun Kumar	
Sanjiv Kumar	
Jialin Lin	

- Formed in 2011 with three-year term
- Goal: Bring together scientists funded by MAPP working on CMIP5-related research projects:
 - Drought, hydroclimate, MJO, ENSO, tropical/extratropical cyclones, T/P patterns...
 - Model biases, projections
- Special collection in J. Climate (22 papers including 3 group papers)
- Significant contribution to IPCC AR5 WGI science on model evaluation and North American climate projections
- Contribution to IPCC AR5 WGII
- Contribution to CMIP6 planning process
- Organization of AGU/AMS sessions



CMIP5 TASK FORCE

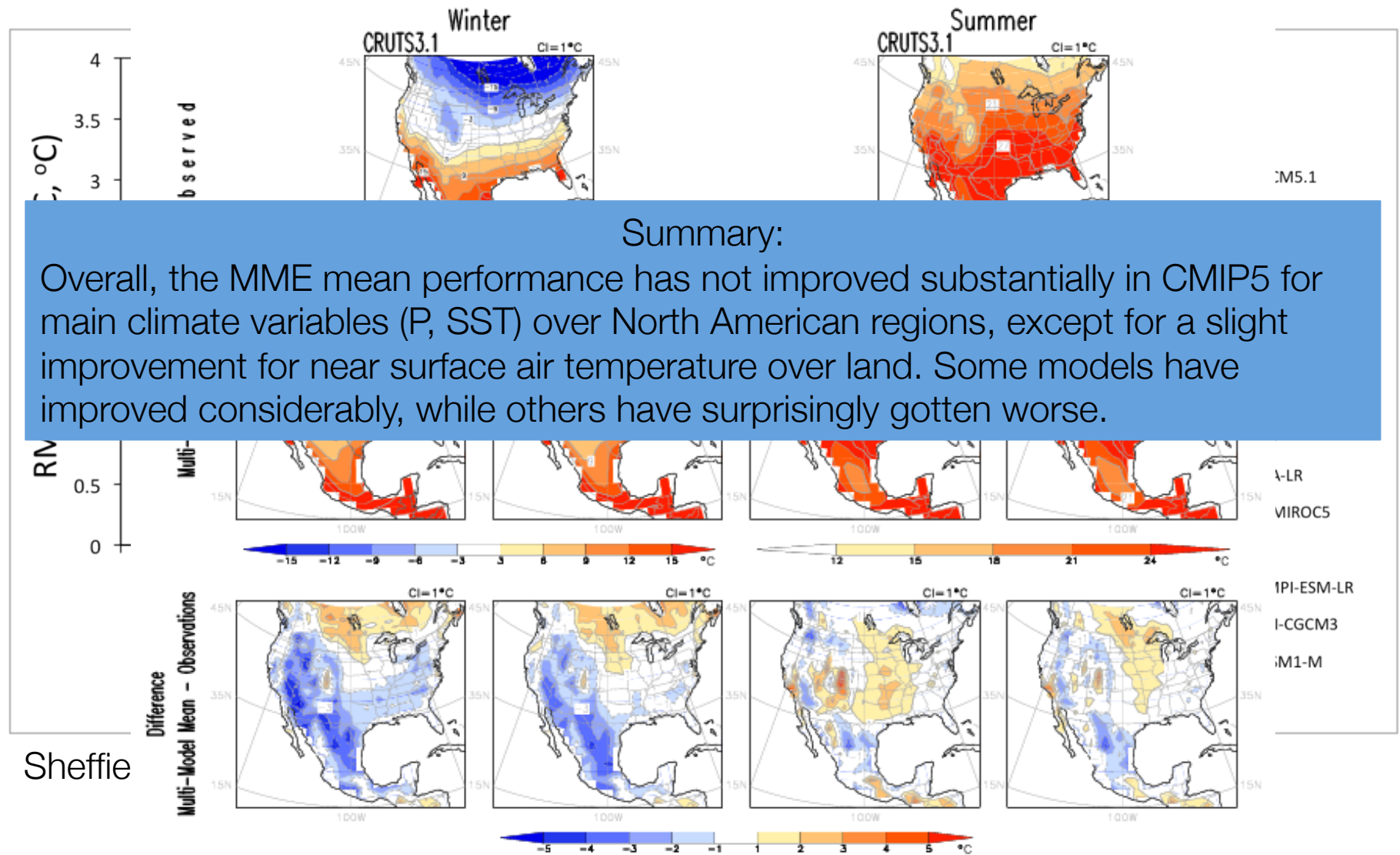
Applications of Task Force members' funded projects



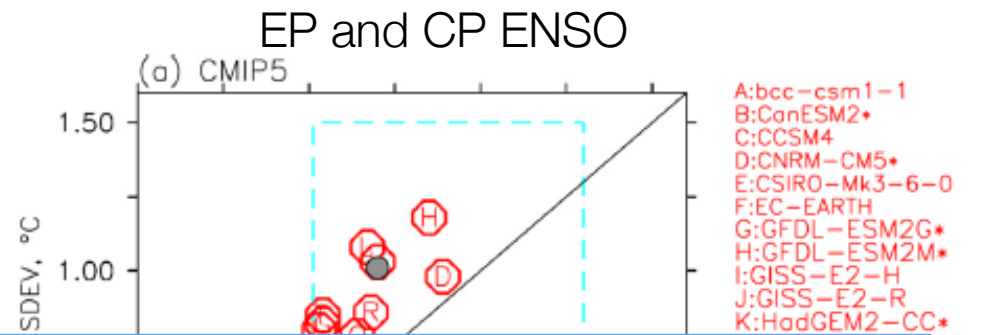
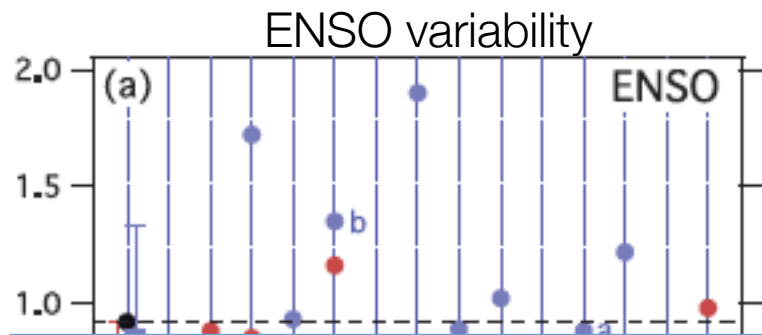
Questions/Issues Addressed (not exhaustive)

1. Have CMIP5 models improved for basic surface climate variables compared to CMIP3?
2. Is PDO variability the same in CMIP3 and CMIP5?
3. Is the AMO better simulated in CMIP5?
4. Goals of the analysis:
 5. 1. To be an aid in communications with the community interested in the results from CMIP5,
 6. 2. To address specific questions on climate impacts, adaptation and vulnerability that are of high interest, in particular the National Climate Assessment (NCA) community
 7. 3. The analysis is intended as an initial effort that can determine the efficacy of such an assessment and advise future such efforts.
8. How much of difference is due to model changes or to different scenarios forcing?
9. Representation of extremes - what steps can be taken to improve it?
10. Increase in Low Level Jet (LLJ) in Great Plains not accompanied by increased precipitation in GP

Have CMIP5 models improved for basic surface climate variables compared to CMIP3?



Better ENSO Skill. But teleconnections generally the same

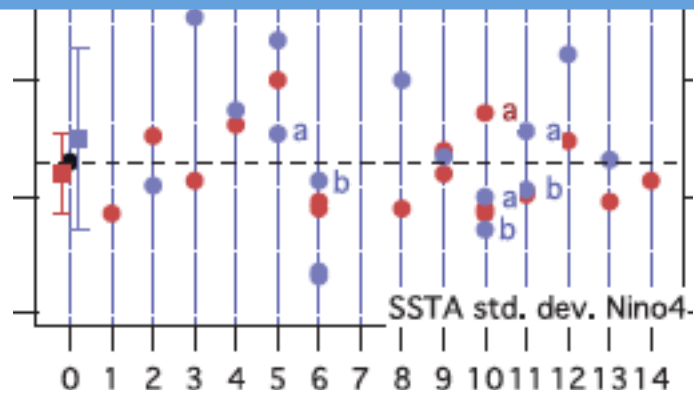


But

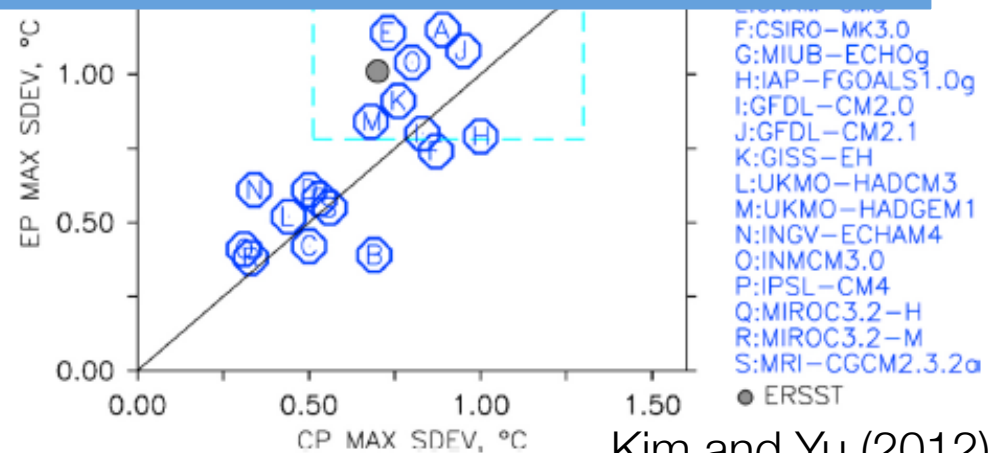
- Phase locking off (fall/winter peak frequencies) – similar to CMIP3
- Little improvement in P teleconnections (globally) since CMIP3

However

- But skill may be related to SST mean state and cool bias
- CMIP5 better at winter T teleconnections with EP ENSO (but not CP)

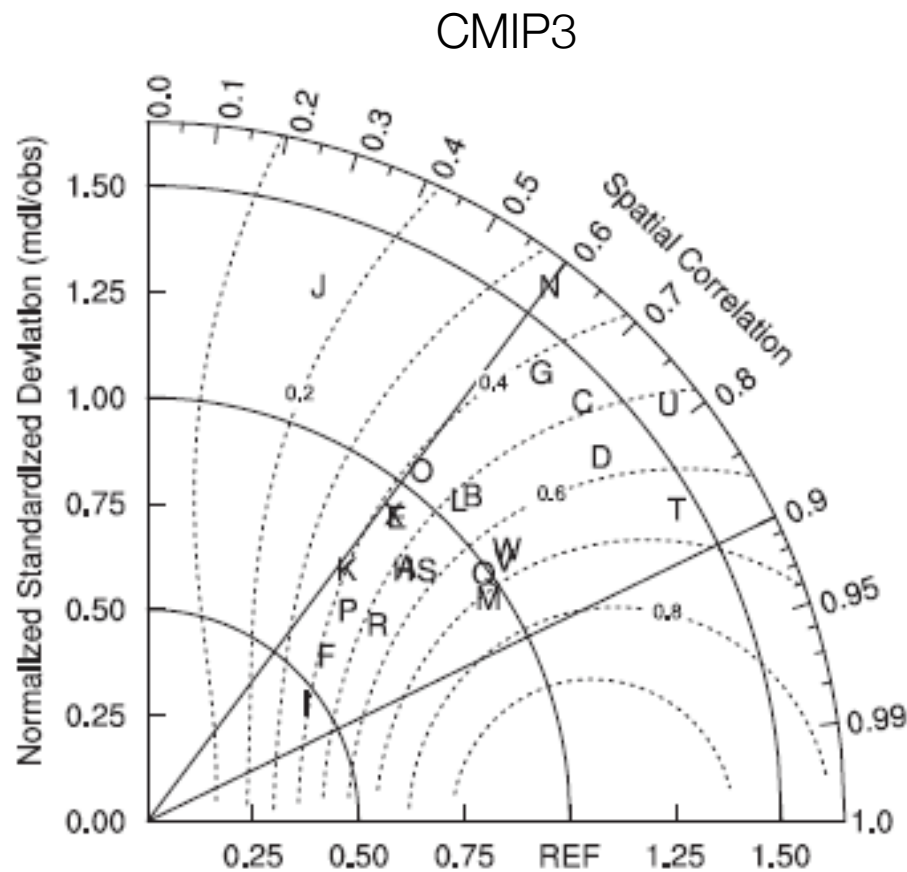


Guilyardi et al., 2012

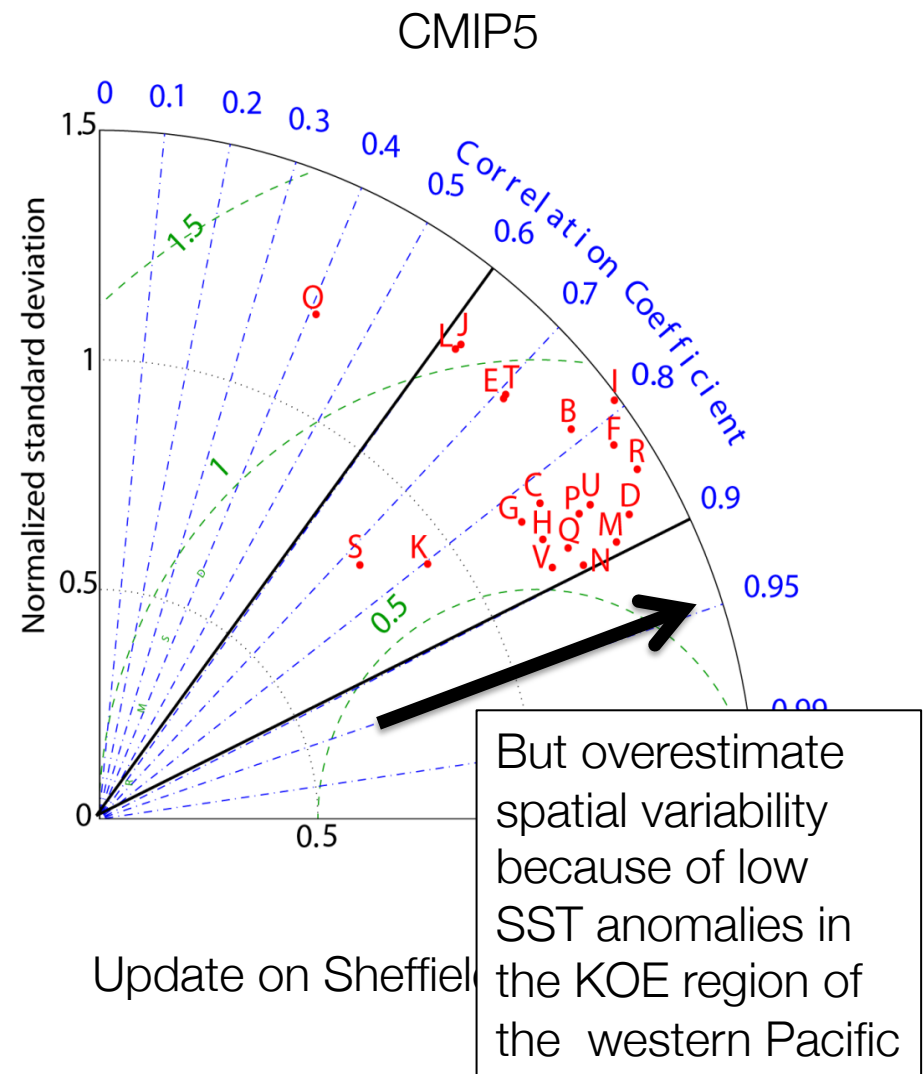


Kim and Yu (2012)

CMIP5 models reproduce the pattern of the PDO slightly better

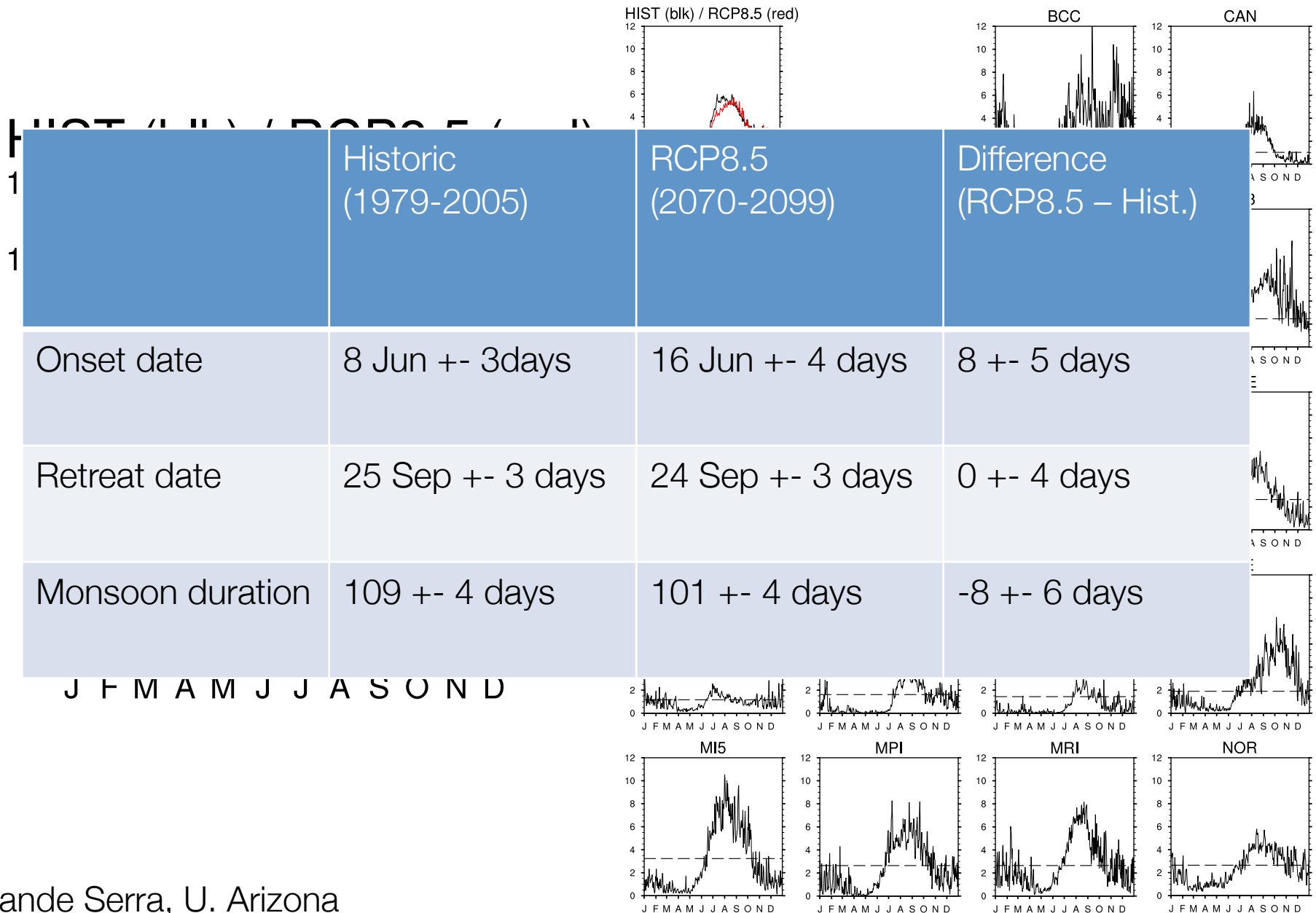


Oshima and Tanimoto 2009



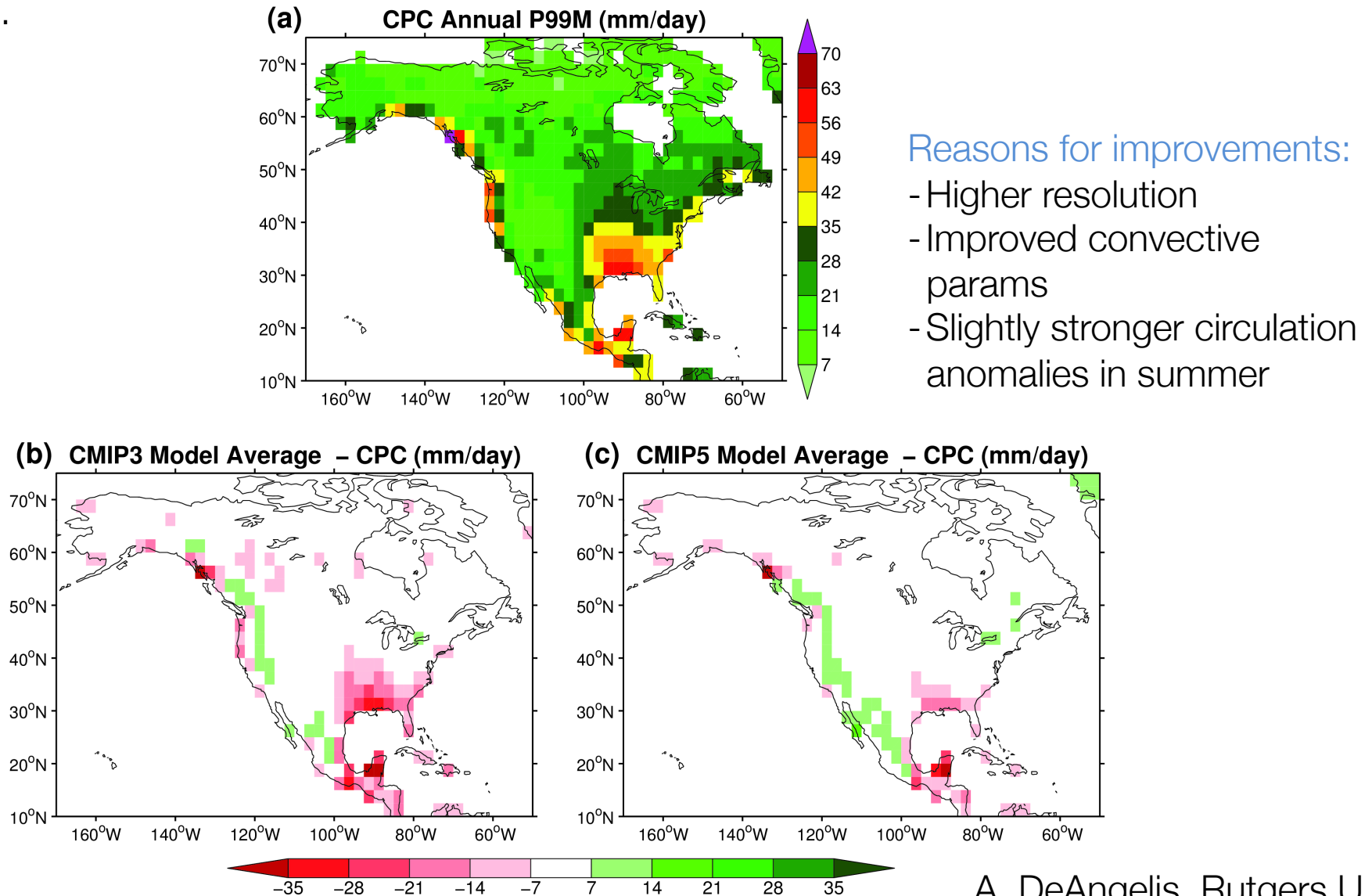
Update on Sheffield

SW Monsoon – changes in amplitude and/or timing?



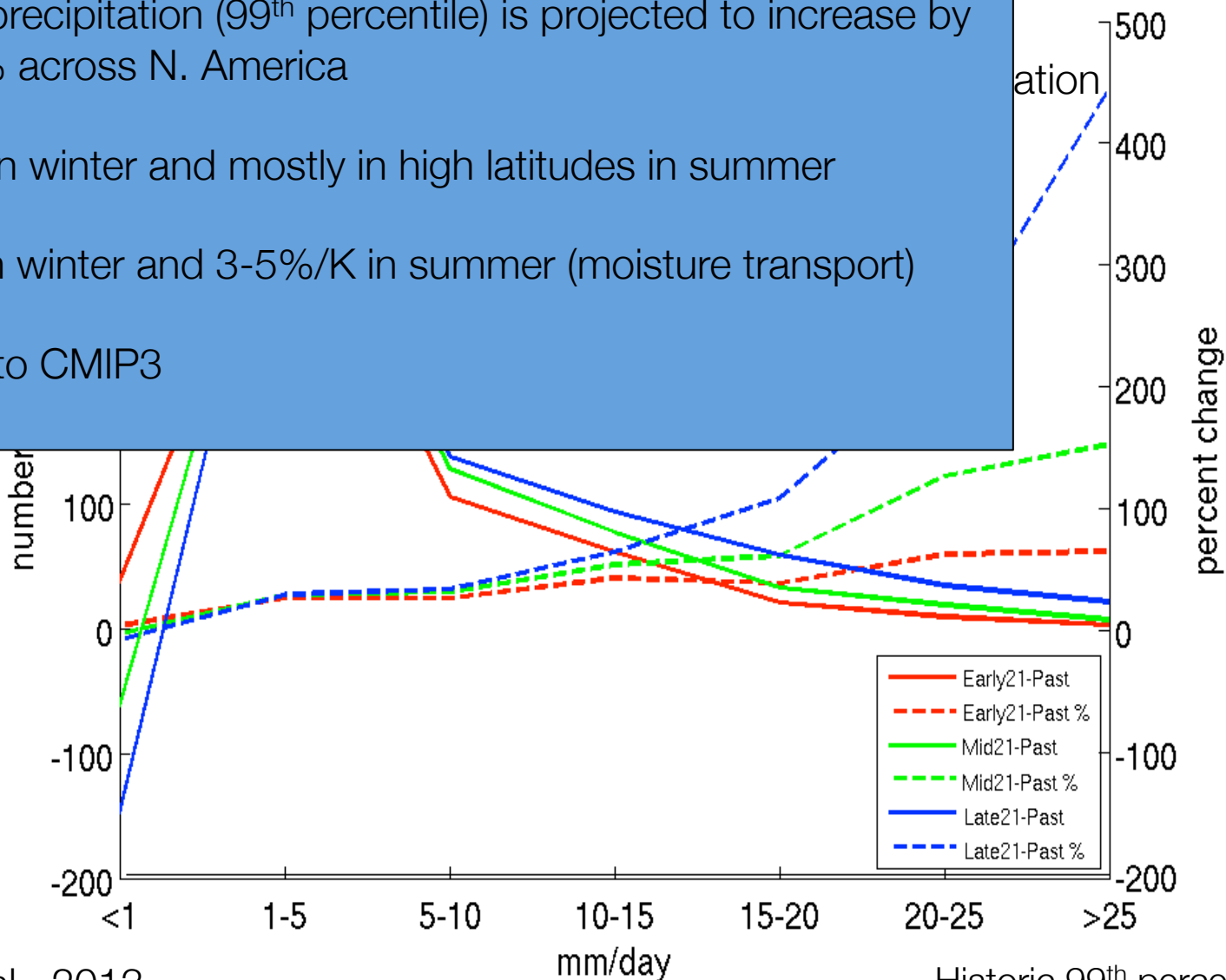
Representation of Extreme Precipitation

Annual extreme precipitation (average precipitation over all days when precipitation equals or exceeds the 99th percentile, P99M) from CPC observations and CMIP3 and CMIP5 MMEs.



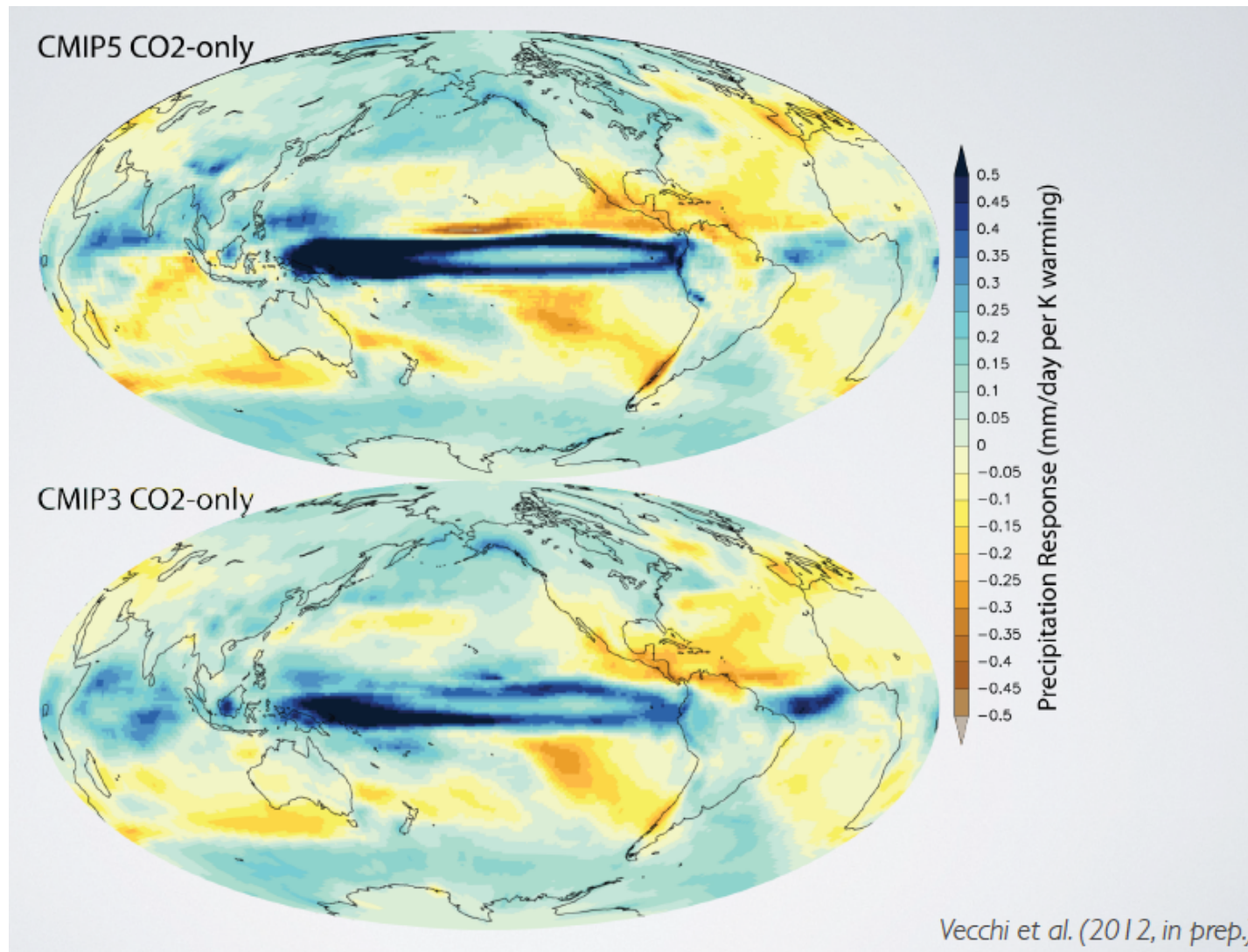
Frequency of heavy precipitation events goes up 2x in early 21C and 5-6x by 2100

- Heavy precipitation (99th percentile) is projected to increase by 20-30% across N. America
- Mainly in winter and mostly in high latitudes in summer
- 7%/K in winter and 3-5%/K in summer (moisture transport)
- Similar to CMIP3

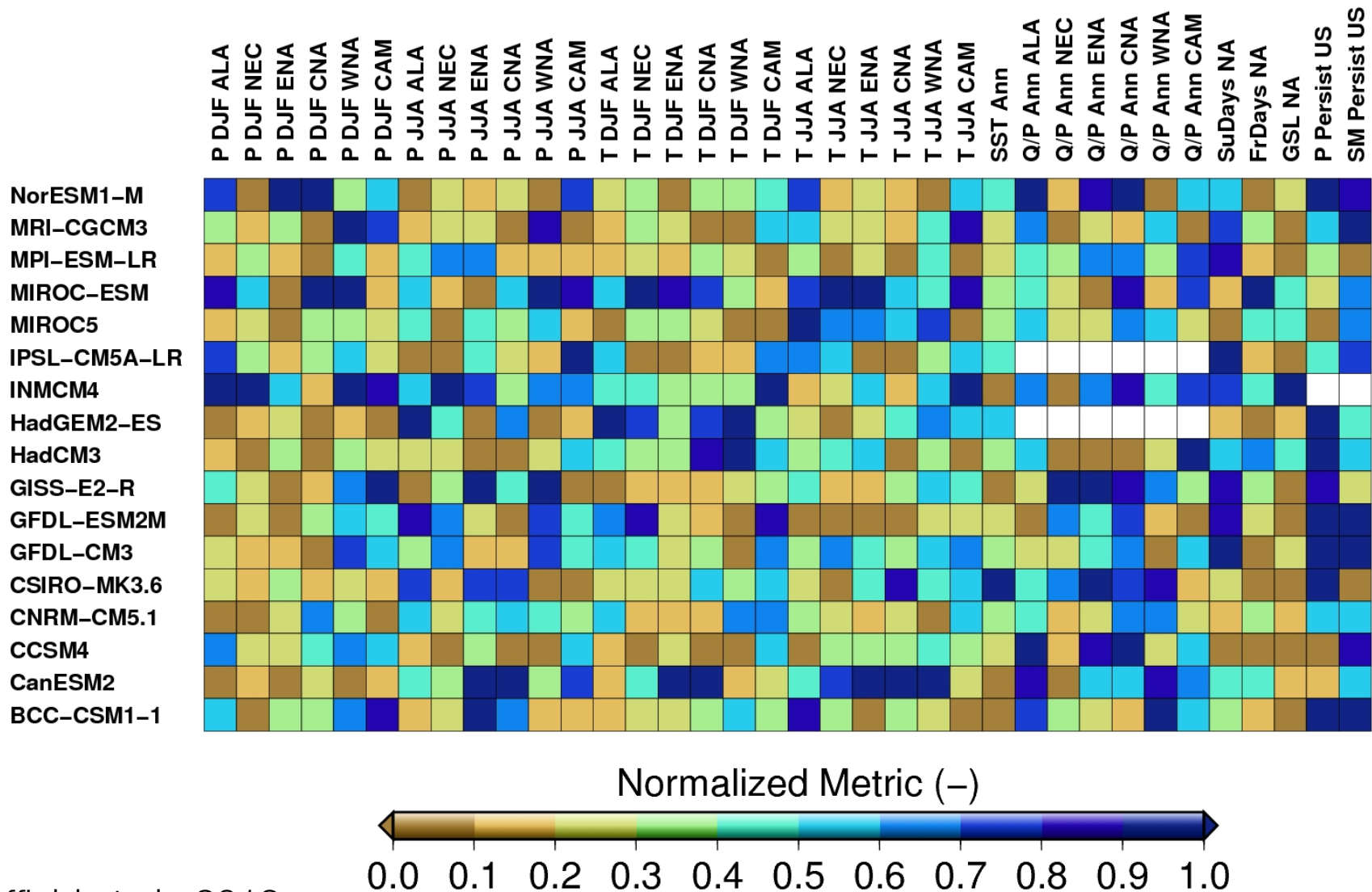


How much of difference in projections is due to model changes and or to different scenario forcing?

CO₂ sensitivity for temperature, hurricane activity, precipitation is similar between CMIP3 and CMIP5 → aerosol treatment and GHG forcing differences are responsible



Discriminating among models that are “better” or “worse” in representing historical climate



Summary

Historic Evaluations

- Representation of basic climate – little change from CMIP3 (except T)
- Representation of PDV, AMV, ENSO – slightly better in CMIP5
- But teleconnections still generally poor – model dependent
- Representation of extremes (P) – better in CMIP5 (resolution, convection)

Future Plans

- NOAA technical report by March/April – foundational report for NCA
- More in-depth analysis to be submitted as a peer-reviewed article by late summer in collaboration with NCDC

Outstanding Questions

- Identifying better models – unclear, depends on variable metric, region, season, etc. Better model → more robust projections?
- How to improve extremes – attribution, resolution, circulation, samples...
- Attribution of shift in SW monsoon
- ...